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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,243	10/17/2003	John A. Schield	194-25141-USD	2491
24923	7590	09/01/2004	EXAMINER	
PAUL S MADAN MADAN, MOSSMAN & SRIRAM, PC 2603 AUGUSTA, SUITE 700 HOUSTON, TX 77057-1130			HERTZOG, ARDITH E	
			ART UNIT	PAPER NUMBER
			1754	

DATE MAILED: 09/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/688,243	Applicant(s) SCHIELD ET AL. S.C.	
	Examiner Ardith E. Hertzog	Art Unit 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11, 12 & 16-20 is/are rejected.
- 7) ☒ Claim(s) 13-15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This action is in response to applicant's amendment filed July 9, 2004. Claims 11-20, as amended therein, are now pending.
2. The text of those sections of Title 35, U.S. Code, not included in this action can be found in the prior Office action with mailing date May 20, 2004 (hereinafter "the 5/20/04 action").
3. The objection to the specification as set forth in the 5/20/04 action, paragraph 2., has been **overcome** by applicant's amendment.
4. The objection to the disclosure as set forth in the 5/20/04 action, paragraph 3., has been **overcome** by applicant's amendment.
5. The 35 U.S.C. § 112, second paragraph, rejection of claims 11-20 as set forth in the 5/20/04 action, paragraph 5., has been **overcome** by applicant's amendment.
6. The 35 U.S.C. § 102(b) rejection of claims 13-16 as being anticipated by Roof (US 5,552,060) as set forth in the 5/20/04 action, paragraph 8., has been **overcome** by applicant's amendment. In particular, these claims now **require specific** scavenging agents **clearly different from** the Roof epoxides.

Minor Informalities

7. The disclosure is objected to, because of the following minor informality: In claim 16, "consisting" should be inserted after with "group" for proper Markush group language (see MPEP § 2173.05(h) I.). Appropriate correction is required.

Claim Rejections - 35 U.S.C. §§ 102 & 103

8. Claims 11, 12, 19 and 20 are again rejected under 35 U.S.C. § 102(b) as being anticipated by Roof (US 5,552,060). This rejection is analogous to that set forth in the 5/20/04 action, paragraph 8. Again, Roof teaches abatement of hydrogen sulfide with epoxides, **exemplifying** several compositions reading upon these claims of applicant, as now broadly recited therein (see Roof abstract and Examples 2, 4, 6-8 and 11). In particular, each Roof inventive example in Examples 2, 4, 6-8 and 11 shows a bottle comprising "hydrogen sulfide laden residual fuel oil (#6 oil)" that has been injected with one of the preferred Roof epoxides—styrene oxide, 1-3-butadiene diepoxide, or cyclohexene oxide (i.e., epoxides clearly within the scope of instant claims 11, 19 and 20, as well as reading upon formula (II) of instant claim 12)—then stored in an oven at 121° C (see, for example, Roof Example 2, noting also col. 4, lines 11-13, 22-23). As 121° C is clearly at or above the melting point of sulfur (120° C), Roof thus exemplifies compositions containing "molten sulfur contaminated with at least one sulfhydryl compound" (i.e., applicant's component a), as broadly recited in both independent claims 11 and 20), in concert with effective amounts of epoxide scavenging agents reading upon applicant's formula (II); note that Roof clearly teaches molar ratios of scavenging agent to sulfhydryl compound ("proportional" or 1:1) which fall within the scope of applicant's claim 20 range (see col. 3, lines 63-65). Also, as Roof reports no color change for any of these exemplary compositions, the "molten sulfur" is evidently "not discolored", as required by instant claim 19. Accordingly, Roof **anticipates** instant **composition** claims 11, 12, 19 and 20, since **compositions** meeting all required limitations thereof are exemplified. It is appreciated that these Roof examples are

“hydrocarbon substrate” compositions “having the evolution of hydrogen sulfide therefrom inhibited”, whereas applicant’s claims recite **“molten sulfur”** compositions “having the evolution of hydrogen sulfide therefrom inhibited”. **However**, applicant’s claims are clearly **open** to the presence of **any** additional component, including hydrocarbons, given the use of the transitional phrase “comprising” (see related discussion in MPEP § 2111.03). Moreover, it is respectfully submitted that this different **preamble** language does not patentably distinguish the instant **composition** claims from those compositions clearly disclosed by Roof, given that, again, these Roof compositions appear to contain all required components in appropriate amounts, with the first required component itself molten sulfur.

9. Claims 17 and 18 are again rejected under 35 U.S.C. § 102(b) as anticipated by **or, in the alternative**, under 35 U.S.C. § 103(a) as obvious over Roof. This rejection is analogous to that set forth in the 5/20/04 action, paragraph 9. Again, Roof is relied upon as set forth immediately above, anticipating applicant’s independent claim 11 (upon which instant claims 17 and 18 depend). Initially, it is noted that instant claims 17 and 18 are in product-by-process form, reciting the manner in which “the scavenging agent is physically mixed with/incorporated into the molten sulfur”. It is again noted that the Roof inventive examples in Examples 2, 4, 6-8 and 11 show compositions which appear to contain **all** components as **required** by instant claims 17 and 18 (note that Roof clearly teaches molar ratios of scavenging agent to sulfhydryl compound (“proportional” or 1:1) falling within the scope of applicant’s claim 17 range (see again col. 3, lines 63-65)). Thus, Roof may also be considered to **anticipate** instant claims 17 and 18, **or, in the alternative**, to have rendered compositions falling within their scope

prima facie obvious, because:

[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). (MPEP 2113)

Alternatively then, if these Roof inventive examples fail in some way to meet the requirements of these two product-by-process claims, then, at the least, compositions falling within the scope thereof are considered to have been *prima facie* obvious, since it would have been within the level of ordinary skill to have determined with minimum testing appropriate processes for making additional Roof compositions "having the evolution of hydrogen sulfide therefrom inhibited". It is noted that the injection method exemplified by Roof could be considered "physically mixed", per instant claim 17, and that Roof discusses the presence of H₂S in vapor phase above hydrocarbon substrate compositions (see col. 3, lines 43-65), in accordance with instant claim 18.

New Grounds of Rejection

10. Claims 11, 16 and 19 are rejected under 35 U.S.C. § 102(b) as anticipated by **or, in the alternative**, under 35 U.S.C. § 103(a) as obvious over WO 97/29834 (hereinafter "Plummer et al."). Plummer et al. teach:

A process for removing liquid sulfur from a reaction mixture during a gas treating process, especially a process for removing hydrogen sulfide from a gaseous stream. **Sulfur which is formed during the process is removed from a reaction mixture by first concentrating the sulfur in a small portion of the reaction mixture and then heating this portion to a temperature which is sufficient to melt the sulfur.** The molten sulfur is removed from the reaction mixture and washed with a suitable solvent to remove any remaining reaction mixture. (Plummer et al. abstract, emphasis added)

Art Unit: 1754

Furthermore, Plummer et al. claim 1 recites:

A process for converting hydrogen sulfide to sulfur comprising:
contacting a feed gas containing hydrogen sulfide with a polar organic solvent having a quinone dissolved therein, said hydrogen sulfide reacting with said quinone to produce sulfur and a hydroquinone in said solvent;
concentrating said sulfur in a portion of said polar organic solvent;
heating said portion of said solvent to a temperature sufficient to melt said sulfur; and
removing said molten sulfur from said polar organic solvent. (emphasis added)

and, in claim 21, Plummer et al. **specifically** recite that the “polar organic solvent” may be “propylene carbonate”—namely, a carbonate which falls within the scope of applicant’s structural formula (V), as recited in instant claim 16. In addition, as Plummer et al. report no color change occurring within the disclosed processes, the “molten sulfur” is evidently “not discolored”, as required by instant claim 19. Accordingly, Plummer et al. **anticipates** instant **composition** claims 11, 12 and 19, since **compositions** meeting all required limitations thereof appear to be **at least implicitly** taught via the Plummer et al. claims. (Note that as the amounts of sulfur and “polar organic solvent” in the “portion” shown in Plummer et al. Example 1 (i.e., 49.33 g sulfur and about 0.49 g NMP, giving about 1.0 wt% NMP) are on the order of those used in instant Examples 1-12 (i.e., about 0.05 wt.% scavenging agent), Plummer et al. are considered to meet the “effective amount” requirement of applicant’s independent claim 11.) **Alternatively**, it could be argued that Plummer et al. do not **fully** anticipate these claims of applicant, since the use of propylene carbonate as the “polar organic solvent” is **not exemplified** (see again Plummer et al. Example 1 on p. 7). **However**, even if **not** anticipated, then compositions falling within the scope of instant claims 11, 16 and 19 are considered to have been *prima facie* obvious to one of ordinary skill in the art, at

Art Unit: 1754

the time of applicant's invention, because, as just discussed, the broad teachings of Plummer et al. **clearly** encompass processes wherein such compositions are **at least implicitly** disclosed (again, via Plummer et al. claim 21). Lastly, it **is** appreciated that the Plummer et al. claims are directed towards processes for converting hydrogen sulfide to sulfur, whereas applicant's claims recite "**molten sulfur**" compositions "having the evolution of hydrogen sulfide therefrom inhibited". **However**, applicant's claims are clearly **open** to the presence of **any** additional component, including the additional components recited in Plummer et al. claim 1, given the use of the transitional phrase "comprising" (see again related discussion in MPEP § 2111.03). Moreover, it is respectfully submitted that this different **preamble** language does not patentably distinguish the instant **composition** claims from those compositions **at least implicitly** disclosed in the Plummer et al. claims—particularly Plummer et al. claim 21—given that, again, such compositions appear to contain all required components in appropriate amounts, with the first required component itself molten sulfur.

11. Claims 11, 12 and 16-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the instant specification, pages 1 - 2, paragraphs [0002] - [0006] and [0008], in view of Roof. This rejection is somewhat similar to that set forth in the parent application, paper no. 4 therein. In the "Background of the Invention" section of the instant specification, applicant states:

The problem of removing or reducing H₂S from molten sulfur has been solved in many different ways in the past. Oxidizers such as sodium or calcium hypochlorite or hypobromite have been used as scavengers in liquid sulfur. Air has also been used as an oxidizer to convert H₂S to elemental sulfur.

Other approaches involve intentionally promoting the evolution or degassing of H₂S from the molten sulfur. That is, various additives are

used to intentionally cause sulfhydryl species such as $H-S-(S)_x-S-H$ to decompose. The H_2S formed is then swept away to a vapor recovery system. Once these materials are decomposed, the sulfur is left with reduced potential to form more H_2S and may be relatively safer to transport. Typical compounds used in such methods contain nitrogen (instant p. 2, paragraphs [0005] – [0006])

Accordingly, based upon applicant's admitted prior art as cited above (per MPEP § 2129), the need to remove or reduce H_2S from molten sulfur, **as well as** methods of doing same by use of various additives were, again, known in the prior art at the time of applicant's invention. However, such use of epoxides, including those of applicant's structural formula (I), as specifically recited in instant claim 12, is **not** acknowledged by applicant as admitted prior art.

12. As discussed in paragraph 8. above, Roof teaches abatement of hydrogen sulfide with epoxides, preferring—and even **exemplifying**—the use of three epoxides, i.e., styrene oxide, 1-3-butadiene diepoxide, and cyclohexene oxide, which are clearly within the scope of instant claims 11 and 20, **and** which also fall within the scope of applicant's claim 12 structural formula (II) (see Roof abstract and Examples). After acknowledging that "[t]he removal of H_2S from a liquid or gaseous hydrocarbon stream is a problem that has challenged many workers in many industries" (see col. 1, lines 14-16), Roof goes on to **explicitly** teach:

The scavenging agents of the present invention are epoxides. Without limiting the invention to any particular theory, the epoxide portion of the molecule is believed to react with the sulfhydryl compounds... Any epoxide should function in the present invention as long as the remainder of the compound does not interfere with this reaction. ... [and]

The epoxide portion of the molecule is believed to be the functional group that actually reacts with the sulfur moiety; therefore, molecules in which the epoxide group is more "accessible" to the sulfur in the substrate should be more efficient scavengers. (col. 2, line 56 – col. 3, line 3, and col. 3, lines 24-28)

Art Unit: 1754

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of applicant's invention, to have added any of the epoxides of Roof to molten sulfur in need of H₂S removal/reduction (again, acknowledged by applicant as admitted prior art), because, as just discussed, Roof **clearly** teaches that such epoxides function as H₂S scavenging agents by, presumably, reaction of the epoxide portion of such molecules with the H₂S sulfur moiety. When having done so, it is respectfully submitted that, absent contrary evidence, compositions falling within the scope of instant claims 11, 12 and 16-20 would have obviously resulted, noting again that: 1) Roof clearly teaches molar ratios of scavenging agent to sulfhydryl compound ("proportional" or 1:1) falling within the scope of applicant's claim 17 and claim 20 range (see col. 3, lines 63-65); 2) the injection method exemplified by Roof could be considered "physically mixed", per instant claim 17; 3) Roof discusses the presence of H₂S in vapor phase above hydrocarbon substrate compositions (see col. 3, lines 43-65), per instant claim 18; and 4) as the Roof preferred epoxides fall within the scope of applicant's claim 12 structural formula (II), the combination of such epoxides with molten sulfur would have obviously "not discolored" the sulfur, per instant claim 19.

Allowable Subject Matter

13. Claims 13-15 are objected to as being dependent upon a rejected base claim but would be allowable **if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

14. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to teach or to have suggested molten sulfur compositions, having the evolution of hydrogen sulfide (H₂S) therefrom inhibited, which

Art Unit: 1754

comprise a) molten sulfur contaminated with at least one sulfhydryl compound; and b) an effective amount to inhibit H₂S evolution of a scavenging agent, **wherein the scavenging agent is:**

--a monoester and/or diester of an unsaturated dicarboxylic acid of applicant's *specific* structural formula (II) (i.e., as presently recited in dependent claim 13);

--an anhydride of applicant's *specific* structural formulae (IIIa), (IIIb), and/or (IIIc) (i.e., as presently recited in dependent claim 14); and/or

--a conjugated ketone of applicant's *specific* structural formula (IV) (i.e., as presently recited in dependent claim 15).

Initially, it is noted that **no** prior art of record teaches or suggests **the combination of** applicant's **specific** monoester and/or diester of an unsaturated dicarboxylic acid (i.e., as recited in instant claim 13) with sulfur, whether in liquid (molten) or gaseous form.

With respect to applicant's **specific** anhydride, as discussed in the 5/20/04 action, paragraph 11., Suzuki et al. (US 3,642,431) teach methods of removing H₂S from gaseous mixtures utilizing, among other components, a dicarboxylic acid anhydride (see abstract; col. 3, lines 3-52), wherein preferred anhydrides fall within the scope of applicant's structural formulae (IIIa) and (IIIc). **However**, given that this patent is **clearly** directed towards the removal of H₂S from **gaseous** mixtures, it **cannot** be concluded that it teaches or would have suggested **combining** such anhydrides with **molten sulfur**, in order to create **a molten sulfur composition containing same**, as required by instant claim 14. **Similarly**, with respect to applicant's **specific** conjugated ketone, as discussed in the 5/20/04 action, paragraph 11., Diaz (US 4,402,930) teaches

that 2,4-pentanedione and 2,5-hexanedione (i.e., conjugated ketones which fall within the scope of applicant's structural formula (IV)), are suitable absorbents having selectivity for H₂S in sulfur recovery processes (see abstract; col. 5, lines 9-27).

However, given that this patent is **also clearly** directed towards the removal of H₂S from **gaseous** mixtures (see, for example, col. 1, lines 8-10 and 35-39, as well as the Diaz claims), it **cannot** be concluded that it teaches or would have suggested **combining** such conjugated ketones with **molten sulfur**, in order to create **a molten sulfur composition containing same**, as required by instant claim 15.

Response to Arguments

15. With respect to the rejections maintained in paragraphs 8. and 9. above, applicant's remarks filed July 9, 2004 have been fully considered, but they have not been found persuasive. Applicant's essential argument appears to be that Roof fails to teach "molten sulfur", as required by all instant claims, hence Roof cannot anticipate nor have rendered *prima facie* obvious such claims, given that this key component is allegedly lacking from the Roof disclosure. However, the examiner respectfully disagrees, since, as shown by the two newly cited references, the specific fuel oil (#6 oil) used in the Roof examples relied upon above **does** in fact contain sulfur. In particular, see Dooher et al. Table 1, which shows such "low sulphur" and "high sulphur" oils containing, respectively, 0.9 and 2.4 wt.% sulfur, and Schulz et al. (US 4,195,986) which states that such oil has "1 to 5% sulfur content" (see col. 1, lines 65-67). Accordingly, it is respectfully maintained that since the Roof examples relied upon above are **explicitly** disclosed as having been stored in an oven at 121° C, with 121° C clearly at or above the melting point of sulfur (120° C), Roof **does** in fact exemplify

Art Unit: 1754

compositions containing “molten sulfur contaminated with at least one sulfhydryl compound” (i.e., applicant’s component a), as broadly recited in both independent claims 11 and 20), in concert with effective amounts of epoxide scavenging agents reading upon applicant’s formula (II). There is presently no **evidence** of record to indicate otherwise (i.e., that the sulfur present in these heated exemplary compositions would **not** have been melted), and it is respectfully noted that “arguments of counsel cannot take the place of evidence in the record. *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997)” (see MPEP § 2145 I.). Applicant also argues that “elemental sulfur is known not to be a hydrocarbon (or to be aqueous, for that matter). There is nothing in Roof that would suggest his epoxides would have any success with respect to molten sulfur” (remarks accompanying applicant’s amendment at p. 13, last paragraph). Insofar as the above rejections are made under 35 U.S.C. § 102(b), it is respectfully submitted that there need be no such suggestion in Roof, given that, again, several examples are still considered to read on the instant claims, with the claims clearly open to all other components of the #6 oil, in addition to (molten) sulfur. Insofar as the above rejections are made under 35 U.S.C. § 103, the examiner respectfully disagrees, since the Roof teachings of how the epoxide is presumed to function as an H₂S scavenging agent are considered sufficient motivation for one of ordinary skill in the art to have incorporated same into compositions containing molten sulfur, at the time of applicant’s invention.

Applicant further argues that:

An important difference is that molten sulfur itself is reactive to many additives. Trying to scavenge H₂S with a chemical agent selective enough for H₂S that does not also react with elemental sulfur was a challenge in

addressing the technical problem solved by the claimed invention.
(remarks accompanying applicant's amendment, paragraph bridging pp. 13-14).

However, there appears to be no **evidence** currently of record concerning this "important difference" (that is, there appears to be no discussion of the above sulfur reactivity problem in applicant's specification or in any references of record). It is again respectfully noted that "arguments of counsel cannot take the place of evidence in the record. *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965)", and further noted that:

Examples of attorney statements which are not evidence and which must be supported by an appropriate affidavit or declaration include statements regarding **unexpected results**, commercial success, **solution of a long-felt need**, **inoperability of the prior art**, invention before the date of the reference, and allegations that the author(s) of the prior art derived the disclosed subject matter from the applicant. (MPEP § 716.01(c) II., emphasis added)

Conclusion

16. Any inquiry concerning this communication or any earlier communications from the examiner should be directed to Ardith E. Hertzog at telephone number is (571) 272-1347. The examiner can normally be reached on Monday through Friday (from about 7:30 a.m. - 3:30 p.m.).

17. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman, can be reached on (571) 272-1358. The fax phone number for the organization where this application is assigned is 703-872-9306.

18. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

Art Unit: 1754


published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. For any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



AEH
August 24, 2004



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